Supply Effects on Price Discovery and Pricing Choice for Fed Cattle

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Practitioner's Abstract: *Price discovery research related to fed cattle has involved data covering a relatively small portion of the longer cattle cycle. Thus, research has not explicitly addressed the impacts alternative supply conditions have on price discovery. Additionally, little research has addressed the pricing choices for fed cattle marketing or procurement. In research reported here using data from an experimental market, the Fed Cattle Market Simulator, models were estimated that encompassed live weight, dressed weight, and grid pricing under alternative supply scenarios, specifically a larger supply and smaller supply period. Variables explaining fed cattle price variation differed somewhat between the two supply periods. For the two periods combined, results were nearly as theoretically expected. One consistent finding was that higher quality fed cattle marketed with a grid brought higher prices in both supply periods. Similarly, some differences were noted in the pricing choice model between the two periods and the combined periods. Another consistent finding was that having lower quality cattle to market increased the probability of marketing them on a live weight basis. Higher quality cattle were more apt to be marketed with a grid.*

Keywords: Cattle, Fed cattle, Marketing, Pricing, Price discovery, Pricing alternatives, Pricing methods

Introduction

After developing the *Fed Cattle Market Simulator* (*FCMS*), data from a semester-long class were used to estimate price discovery models (Ward et al. 1996). Models were patterned after and results paralleled previous research with industry data (Ward 1981, 1992; Schroeder et al. 1993). However, in the late-1990s, pricing methods in the industry changed and the *FCMS* became somewhat dated and less relevant to industry audiences. Thus, the *FCMS* underwent a major revision, incorporating three genetic types of cattle instead of one and adding dressed weight and grid pricing to live weight and forward contract pricing (Hogan et al. 2003). The combined result significantly expanded decision making regarding when and how to market specific genetic types of cattle at each of five weights by one of four cash-market pricing methods. These changes greatly affected price discovery and pricing choices by market simulator participants.

Considerable research has been conducted on grid pricing (Feuz, Fausti, and Wagner 1993, 1995; Fausti and Feuz 1995; Schroeder and Graff 2000; Anderson and Zeuli 2001; Feuz 1999; Fausti and Qasmi 2002; Whitley 2003; McDonald and Schroeder 2003). And additional price discovery models have been estimated for fed cattle since those cited earlier (Ward, Koontz, and Schroeder 1998; Schroeter and Azzam 2003, 2004). However, no price discovery models have explicitly incorporated grid pricing, nor have any explicitly considered how factors affecting price discovery change during periods of higher or lower supplies of cattle, as in a cattle cycle. Only one pricing choice model has been estimated for fed cattle (Capps et al. 1999) and that was prior to the rapid shift to grid pricing between 1996 and 2001 (Schroeder et al. 2002). However, pricing choice models have been applied to crop commodities (see Vergara et al. 2004 and references therein). Too, no pricing choice models have been estimated to determine how pricing method alternatives for fed cattle are affected by cyclic changes in supply conditions.

This research had dual objectives. First was to determine factors affecting price discovery in an experimental market for fed cattle under varying supply conditions, specifically incorporating alternative pricing methods and qualities of fed cattle. Second was to determine the choice of pricing methods by market simulator participants under varying supply conditions.

Data and Procedures

Data for the price discovery and pricing choice models were from a day-and-a-half-long *FCMS* workshop with employees of Cargill Meat Solutions in January 2004. Employee-participants consisted of Caprock Industries' (Cargill's cattle feeding company) feedlot managers, Excel Corporation's (Cargill's meatpacking company) cattle buyers, meat and byproducts salespersons, and plant and corporate personnel (such as information technology, quality control, transportation, and human resources). The workshop was conducted as is customary for *FCMS* workshops, with a typical starting point (week 21 of the simulator), a learning period beginning with live weight pricing only, then progressing to dressed weight pricing only, and subsequently to grid pricing only, before allowing participants to choose any pricing method. Data collection began after the learning period ended, in week 34 and extended through week 60. The unit of observation is a transaction for one pen of fed steers. Total transactions numbered 1,066. Data could be characterized as cross-section, time-series data or panel data.

A regression model was specified and estimated with individual transaction prices as the dependent variable. Independent variables were similar to previous price discovery research but also included genetic type of the cattle and pricing method. Workshop data were divided into two groups of nearly equal trading duration, i.e., a high supply period (weeks 34 to 45) and a low supply period (weeks 46 to 60) (Figure 1). The same model specification was estimated separately for each supply period and the combined periods.

In addition, an ordered logit regression model was estimated with the dependent variable being the choice of pricing fed cattle by live weight, dressed weight, or grid. The objective was to determine factors affecting use of alternative pricing methods. This model specification was also estimated separately for high supply and low supply periods and for the entire data period.

Table 1 is a summary of the data for the two supply periods. During the high supply period, live weight and dressed weight prices for fed cattle and boxed beef prices were significantly lower than the low supply period based on a t test of sample means. Conversely and as expected, weekly marketings (or slaughter) and the show list inventory of cattle available for sale were significantly higher during the high supply period than the low supply period. The Choice-Select price difference was significantly lower during the high supply period while the yield grade 4-5 price difference was higher. Both related to the show list inventory and marketing/slaughter weight (Hogan et al. 2002).

Table 2 shows the distribution of transactions by pricing method for the two data periods. Chi-square tests indicated significant differences in how simulator participants priced fed cattle during the high supply and low supply periods. Grid pricing was more prevalent during both periods, both absolutely and relatively, followed by live weight pricing in the high supply period and dressed weight pricing in the low supply period. Forward contracting increased absolutely and relatively during the low supply period compared with the high supply period.

Models Estimated

Price Discovery Model – The price discovery model estimated was similar to that estimated in Ward et al. 1996 with market simulator data from the original version of the simulator. Three variables were deleted from the previously estimated model and one variable not available previously was added. The model estimated was

$$\begin{aligned}(1)\quad & Price_i = \alpha + B_1 BoxedBeef_{t-1} + B_2 ShowList_t + \sum_{j=1}^{4} B_{3j} LiveWt_j \\ & + \sum_{j=1}^{3}\sum_{k=1}^{3} B_{4jk} MethodGenetics_{jk} + \sum_{j=1}^{2} B_{5j} TransactionType + \sum_{j=1}^{8} B_{6j} Feedlot_j \\ & + \sum_{j=1}^{4} B_{7j} Packer_j\end{aligned}$$

where variables are defined in Table 3. Variables deleted from the previous model were: total marketings/slaughter in the current period, proven to be less important in capturing available supply effects on transaction prices than the show list variable; potential profit or loss, questioned by reviewers as an appropriate proxy for bargaining power between buyers and sellers; and futures market prices, excluded due to insufficient data for all weeks in the Cargill workshop.

The variable added was of keen interest as it makes this model unique relative to any previous research. That variable was for the combination of pricing method and genetic type of cattle marketed. The focus was to determine how the interaction between pricing method and cattle quality characteristics influenced prices paid and received.

Carlberg and Ward (2003) offer a theoretical foundation for the price discovery model specified here. The specified model was estimated by feasible generalized least squares (SAS Institute 2002-03) to account for heteroskedasticity inherent in cross-section, time-series data from the market simulator. Live weight prices were converted to dressed weight prices based on the known dressing percentage for each genetic type and weight class of fed cattle in the market simulator. Net grid prices were the negotiated dressed weight base prices plus premiums and discounts for known carcass characteristics of the simulator. A fixed premium of $8/cwt. was assumed for prime carcasses; a fixed premium of $4/cwt. for yield grade 1-2 carcasses; and a fixed $10/cwt. discount for light and heavy carcasses. The discounts for Select and yield grade

4/5 carcasses were dependent on market conditions (Hogan et al. 2003).

Pricing Choice Model – The pricing choice model drew from Capps et al. 1999 but was modified to fit the market simulator structure and data. Capps et al. 1999 present the theoretical rationale for their multinominal logit model. Here, an ordered logit model was estimated (SAS Institute 2002-03) to determine the probability of pricing fed cattle by alternative methods. An ordered logit model was chosen because moving from live weight to dressed weight to grid pricing represents a shift in risk acceptance from the packer to the feeder (Ward 1987; Feuz, Fausti, and Wagner 1995), thus also representing an ordering in terms of risk tolerance or acceptance by cattle feeders. The model estimated was

$$\begin{aligned}
&\mathrm{Pr}\,icingMethod_{ij} = \alpha + B_1 BoxedBeef_{t-1} + B_2 ShowList_t \\
(2)\quad &+ \sum_{j=1}^{4} B_{3j} LiveWt_j + \sum_{j=1}^{3} B_{4j} GeneticType_j + \sum_{j=1}^{2} B_{5j} TransactionType_j \\
&+ B_6 ChoiceSelect_t + B_7 Y3Y4/5_t + \sum_{j=1}^{8} B_{8j} Feedlot_j + \sum_{j=1}^{4} B_{9j} Pac\mathrm{ker}_j
\end{aligned}$$

where variables are defined in Table 3. A key focus of the model was how cattle feeders chose a pricing method for cattle with differing carcass characteristics, as indicated by the genetic type of cattle available to market.

Results

Price Discovery Model – The explanatory power of the price discovery model differed between the two supply periods; and while the ability of some variables to explain the variation in transaction prices was robust, for others it was not. Results are shown in Table 4.

Boxed beef was positively and significantly related to transaction prices in all models as expected and as has been found typically in previous research. The inventory of market-ready cattle behaved as expected in the two supply periods combined but not in each period. It carried the correct sign but was not significant in the high-supply period. In the low-supply period, the show list coefficient was positive and significant. Theoretically, this finding would be unexpected; but based on casual observation of workshop participants during many *FCMS* workshops, it was not unexpected. During low supply periods, insufficient market-ready cattle are available for every packer to operate its plant at the minimum-cost volume unique to each packer. Therefore, any increase in available supplies, rather than depressing prices, stimulates buying competition and positively affects transaction prices.

Related to the explanation just put forth is the finding for weights of fed cattle. In the high-supply period, ample pens of cattle are available for packers to meet or exceed their minimum-cost volume; thus, no lighter weight cattle (1100 and 1125 pounds) were traded. In the low-supply period, lighter and less finished, “green” cattle are marketed or “pulled forward” and are paid a premium consistent with packers' desire to fill its plant capacity needs. Previous research with market simulator data has consistently found packers paid a discount for heavier cattle, typically smaller for 1175-pound cattle than for 1200-pound cattle. That occurs for two reasons. First is that feeders are severely discounted for fed cattle not sold at 1200 pounds. This in part represents the penalty for over-finishing cattle. Second, and related to the first point, the negotiating strength shifts to the packers as fed cattle move into the heavier weight classes; thus increasing the observed discount for heavier fed cattle, despite the fact that heavier cattle are more economical for packers than lighter cattle.

Of particular interest was the effect on transaction prices from the interaction of pricing method and genetic type. Many economists familiar with grid pricing recommend, in general, marketing higher quality cattle with a grid and lower quality cattle on a live weight basis. This relates to the risk acceptance for each pricing method and unknown carcass characteristics of cattle marketed. In the market simulator, carcass characteristics are known by feeders and packers, unlike in the real-world fed cattle market. The general recommendation of economists was borne out in the estimated models to some extent. Packers paid a consistently lower price for high quality cattle marketed on a live weight basis, regardless of the supply period, compared with the base variable (medium quality cattle priced on a dressed weight basis). Similarly, there was a consistently higher price paid by packers for higher quality cattle marketed on a grid, regardless of supply period. In addition, during the low-supply period, low quality cattle received a price premium when purchased on a live weight basis. This may be explained in part by the packers' need for numbers of fed cattle, regardless of quality, to meet their plant capacity needs. Thus, packers may have been more attentive to prices paid for other qualities of cattle marketed by alternative methods and paid whatever was necessary to purchase the lower quality cattle to keep the plant operating as efficiently as possible.

Carleton (1979) theorized that forward contract prices should be lower than cash prices. In previous research with market simulator data, results have been mixed. Some insight can be gained by results for the two supply periods. During the high supply period, the general price level trended downward. Participants in the *FCMS* typically negotiate forward contract prices in week t for delivery in week t+2. Therefore, as results indicated, forward contracted prices were higher than cash market prices in the high-supply period. Forward contract transactions negotiated in the current market period, if packers do not explicitly recognize the expected market decline, potentially could be higher than prices negotiated in the cash market in subsequent weeks when contracted cattle are delivered. The same was not found for the low-supply period in which cash and forward contract prices were not significantly different.

Previous *FCMS* research has consistently found significant differences among some feedlot and packer teams. More significant differences were found in this workshop during the low-supply period than the high-supply period. One explanation may be that when cattle numbers are lower, feedlots especially, but packers to a limited extent, have more opportunity to differentiate themselves from their rivals. For feedlots, the base or comparison feedlot (#8) was the one known to be slightly larger when the *FCMS* is played for a long time period such as a semester-long class. The comparison packer was the largest, lowest-cost packer (#4). For the two supply periods combined, the most efficient packer was able to capitalize on its lower cost structure and pay higher prices than two of its rival packers.

Pricing Choice Model – The pricing choice model results differed somewhat between supply periods, like the price discovery model, but were generally consistent with the price discovery model results. The ordered logit model was estimated to determine factors affecting the probability of using alternative pricing methods. Results are presented in terms of the likelihood of using a lower ordered pricing method, either dressed weight or live weight, compared with grid pricing.

For the low-supply period and both periods combined, the wholesale price level for boxed beef affected the likelihood of using grid pricing (Table 5). As prices increased from the mean level, the probability of using dressed weight or grid pricing compared with live weight pricing increased. This may be related to the fact that as the general price level increases, each pen of cattle becomes more valuable and the marginal or relative importance of how the cattle are priced increases.

For the high-supply period and both periods combined, the size of the show list of available cattle affected the pricing method chosen. As the show list size increased, feeders and packers were more likely to use dressed weight or live weight pricing. Packers may be less apt to purchase cattle on a grid during periods when they have the negotiating strength, as they do during high-supply periods.

Weight of fed cattle marketed had only a limited effect on pricing choice in terms of coefficient significance but a larger effect based on the odds ratios. In the low-supply period and the two periods combined, trades involving cattle weighing 1175 pounds increased the probability of using dressed weight or grid pricing. According to the odds ratios, transactions involving 1175-pound fed cattle were 2.0-2.3 times more apt to be traded with dressed weight or grid pricing.

A focus for this model was on whether or not feeders and packers chose a specific pricing method for fed cattle with given carcass characteristics or a specific genetic type. Results provide evidence that cattle quality characteristics matter. For both supply periods and the two periods combined, the probability of using dressed weight or live weight pricing increased for low quality or low genetic-type cattle. Similarly, for the high-supply period and both periods combines, trading high quality cattle increased the probability 1.4-2.1 times that buyers and sellers traded on a grid or dressed weight basis. These results are consistent with the price discovery results noted above.

Results for the influence that transaction type makes were a bit surprising. In the high-supply case, use of forward contracts increased the probability of choosing dressed weight or grid pricing. However, this may have been due to a specific feeder-packer relationship or was packer influenced, since observed forward contracts in the *FCMS* typically are priced on a live weight basis.

For the two periods combined, but not for high-supply or low-supply periods individually, and both for the Choice-Select discount and the YG3-YG4/5 discount, widening of the discount (meaning larger discounts) increased the probability of using dressed weight or grid pricing. This finding was unexpected since increasing the discount for a given quality of cattle, *ceteris paribus*, reduces the net grid price

Not surprisingly, some feedlot teams and some packer teams had a different propensity to use specific pricing methods relative to their rivals. However, no consistency was noted for the behavior across feedlot and packer teams.

Summary and Conclusions

Data from a Fed Cattle Market Simulator workshop with a large meatpacking firm were used to estimate price discovery and pricing choice models under two divergent supply scenarios. Previous price discovery and pricing choice models have not explicitly considered market behavioral differences stemming from widely varying supply conditions, as in opposite periods of the cattle cycle. Neither have previous price discovery or pricing choice models specifically incorporated grid pricing, despite grid pricing increasing in relative importance as a pricing alternative.

Many relationships between dependent variables in the price discovery model were similar to those found in previous price discovery research on fed cattle, especially for the two supply periods combined. However, differences between supply periods were also found. Differences frequently can be explained by behavioral differences among workshop participants operating under diverse supply conditions. Thus, price discovery is influenced by supply conditions, such as different stages of the cattle cycle.

The interaction of pricing method and genetic type of cattle also led to differences in findings during the two supply periods. Consistently across supply periods, pricing high quality cattle on a live weight basis brought lower prices compared with marketing medium quality cattle on a dressed weight basis. Conversely, marketing higher quality cattle on a grid consistently resulted in higher prices paid for cattle.

Another difference noted between supply periods was the use and price differences between cash and forward contract transactions. During the high supply period, forward contracts received higher prices compared with cash transactions. This was likely related to buyers not forecasting future prices on a declining market correctly when negotiating a forward contract in week t for future delivery (t+2 or more).

Some relationships between dependent variables in the pricing choice model also differed between supply periods. Higher wholesale prices in the low supply period led to an increased probability of using grid pricing, while a higher inventory of market-ready cattle in the high supply period led to an increased probability of using live weight pricing. These findings are consistent across supply periods.

In both supply periods individually and combined, having lower quality cattle increased the probability of pricing them on a live weight basis. Having higher quality cattle tended to increase the probability of marketing them on a grid.

As hypothesized *a priori*, and consistent with observed behavior of market simulator participants, pricing and competitive behavior change as supply conditions change, which may be likened to producers experiencing a cattle cycle. While not a profound finding *per se*, this difference needs to be recognized and considered when observing and anlyzing price discovery for any given period to correctly evaluate and understand factors affecting price discovery and pricing behavior in the fed cattle market. Supply conditions translate into behavioral changes on the part of cattle feeders and packers, thereby influencing the use of marketing methods and pricing outcomes.

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Figure 1. Show list inventory periods

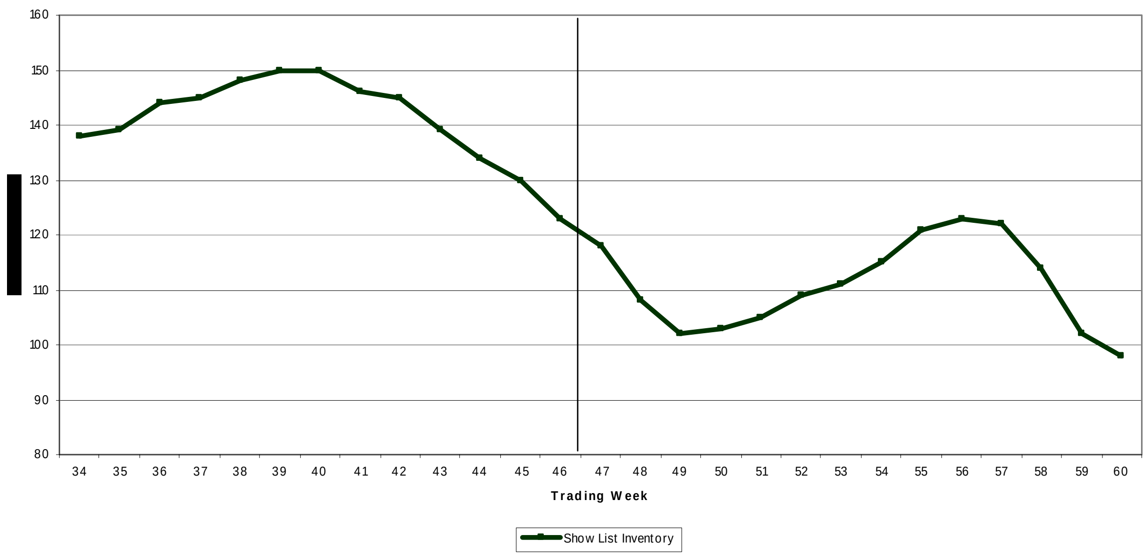

Table 1. Mean values for selected variables from an Excel Corp. workshop, January 2004, by supply period

Variable	High Supply Period	Low Supply Period
Live-weight fed cattle price ($/cwt.)*	72.25	79.82
Dressed-weight fed cattle price ($/cwt.)*	114.55	126.47
Weekly marketings/slaughter (number of pens)*	42.8	37.3
Boxed beef price ($/cwt.)*	116.28	122.30
Show list inventory (number of pens)*	142.5	111.5
Choice-Select price difference ($/cwt.)*	-4.97	-5.18
Yield grade 3-4/5 price difference ($/cwt.)**	-10.02	-9.94

* Significant mean difference based on t-test at 0.01 level with unequal variances
** Significant mean difference based on t-test at 0.01 level with equal variances

Table 2. Cash and contract pricing from an Excel Corp. Workshop January 2004, by supply period

Variables	High Supply Period	Low Supply Period
	(Number of transactions)	
Cash Pricing Method*		
Live Weight	133	52
Dressed Weight	125	184
Grid	259	313
Cash vs. Contract Pricing*		
Cash	453	376
Forward Contract	64	173

* Significant mean difference in chi-square at 0.01 significance level

Table 3. Definition of FGLS and Ordered Logit Variables and Expected Signs

Dependent Variable	Variable Definition	
Price$_i$	Transaction price ($/cwt) for the ith pen of fed cattle	
PricingMethod$_{ij}$	Pricing method choice j for the ith pen of fed cattle; j=1-3, 1=live weight, 2=dressed weight, 3=grid	
Independent Variable	**Variable Definition**	**Expected Sign**
BoxedBeef$_{t-1}$	Boxed beef price in period t-1	+
ShowList$_t$	Inventory of pens available for sale (1100 to 1200 pounds) in week t	-
LiveWt$_{ij}$	Zero-one dummy variable for weight of fed cattle sold for the ith pen of fed cattle; j=1-4, 1=1125 lbs., 2=1150 lbs., 3=1175 lbs., 4=1200 lbs.; Base=1150 lbs.	+/-
MethodGenetics$_{ijk}$	Zero-one dummy variable for pricing method (j) and genetic type (k) interaction for the ith pen of fed cattle; j=1-3, 1=live weight, 2=dressed weight, 3=grid; k=1-3, 1=low genetic type, 2=medium genetic type, 3=high genetic type; Base=dressed weight, medium genetic type	+/-
GeneticType$_{ij}$	Zero-one dummy variable for genetic type (j) for ith the pen of fed cattle; j=1-3, 1=low genetic type, 2=medium genetic type, 3=high genetic type; Base=medium genetic type	-/+
TransactionType$_j$	Zero-one dummy variable for type of transaction; j=1-2, 1=cash, 2=forward contract; Base=cash	-
Feedlot$_j$	Zero-one dummy variable for feedlot team; j=1-8; 1=1, 2=2, … 8=8; Base=8	+/-
Packer$_j$	Zero-one dummy variable for packer team; j=1-4; 1=1, 2=2, … 4=4; Base=4	+/-

Table 3. Definition of FGLS and Ordered Logit Variables and Expected Signs

Independent Variable	Variable Definition	Expected Sign
$ChoiceSelect_t$	Price difference ($/cwt.) between Choice and Select carcasses in week t	-
$YG3YG4/5_t$	Price difference ($/cwt.) between yield grade 3 and yield grade 4/5 carcasses in week t	-

Table 4. Price Discovery Estimation Results

Independent Variable	Coefficient		
	High Supply Period	Low Supply Period	Combined Period
Intercept	6.4483* (1.79)	-90.2587*** (30.47)	-47.8995*** (16.17)
$BoxedBeef_{t-1}$	0.9491*** (33.11)	1.6600*** (78.94)	1.4601*** (66.48)
$ShowList_t$	-0.0154 (0.99)	0.1081*** (7.59)	-0.0506*** (7.92)
$LiveWt_j$ (1125)	NA	3.2099*** (7.13)	4.0082*** (12.78)
(1150)	Base	Base	Base
(1175)	-1.4189*** (5.38)	-0.5854* (1.87)	-0.2627 (1.07)
(1200)	-3.7812*** (7.37)	-5.5572*** (4.40)	-1.2139** (2.26)
$MethodGenetic_{jk}$ (Live, Low)	-0.4749 (1.09)	2.4409*** (3.26)	0.1907 (0.38)
(Live, Medium)	-0.7729* (1.83)	0.3966 (0.73)	0.0074 (0.02)
(Live, High)	-3.0112*** (5.34)	-1.0927* (1.74)	-1.9423*** (3.19)
(Dressed, Low)	-0.1048 (0.30)	-0.3780 (1.00)	-0.2688 (0.65)
(Dressed, Medium)	Base	Base	Base
(Dressed, High)	0.0165 (0.04)	-1.1336** (2.56)	-1.0701*** (2.63)

Table 4. Price Discovery Estimation Results

Independent Variable		Coefficient		
		High Supply Period	Low Supply Period	Combined Period
	(Grid, Low)	-0.3646	-0.0468	0.0655
		(0.75)	(0.11)	(0.17)
	(Grid, Medium)	0.1686	0.1521	0.7105**
		(0.49)	(0.41)	(2.25)
	(Grid, High)	0.8105**	0.8105*	1.2076***
		(2.40)	(1.96)	(3.60)
$TransactionType_j$	(Cash)	Base	Base	Base
	(Forward Contract)	2.6589***	0.1335	1.6653***
		(6.52)	(0.39)	(5.51)
$Feedlot_j$	(1)	-0.9150	1.8934***	-0.1067
		(1.79)	(4.20)	(0.25)
	(2)	-0.1752	3.3690***	1.1428***
		(0.37)	(6.93)	(2.83)
	(3)	-0.0727	2.9348***	0.5828
		(0.16)	(7.15)	(1.40)
	(4)	-0.1164	2.2406***	0.3828
		(0.23)	(4.22)	(0.85)
	(5)	0.5924	1.3635***	0.4785
		(1.09)	(3.45)	(1.08)
	(6)	0.2418	1.3218***	0.1266
		(0.55)	(2.97)	(0.33)
	(7)	1.1420**	1.6946***	1.5740***
		(2.37)	(3.68)	(3.84)
	(8)	Base	Base	Base
$Packer_j$	(1)	0.0217	-1.0823***	-0.7928***
		(0.07)	(3.34)	(2.89)

Table 4. Price Discovery Estimation Results

Independent Variable	Coefficient		
	High Supply Period	Low Supply Period	Combined Period
(2)	0.0251 (0.25)	0.5577 (1.56)	-0.3254 (1.11)
(3)	0.0214 (0.07)	-0.3494 (1.10)	-0.8810*** (3.20)
(4)	Base	Base	Base
n	517	549	1066
Adj R^2	0.774	0.953	0.902

Numbers in parentheses are absolute values of calculated t statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.

Table 5. Pricing Choice Estimation Results

Independent Variable	Coefficient		
	High Supply Period	Low Supply Period	Combined Period
Intercept 2	12.903 (1.63)	8.023 (0.58)	4.450 (1.13)
Intercept 3	11.321 (1.26)	5.595 (0.28)	2.794 (0.44)
$BoxedBeef_{t-1}$	0.022 (0.27)	0.090*** (21.73)	0.055*** (16.63)
$ShowList_t$	-0.082*** (19.21)	-0.014 (0.86)	-0.013*** (10.73)
$LiveWt_j$ (1125)	NA	1.354 (1.04)	0.853 (0.55)
(1150)	Base	Base	Base
(1175)	0.430 (2.04)	0.675** (5.24)	0.616*** (10.71)
(1200)	-0.556 (1.060)	-0.930 (2.00)	-0.233 (0.40)
$GeneticType_j$ (Low)	-1.205*** (26.20)	-0.614*** (7.67)	-0.804*** (29.53)
(Medium)	Base	Base	Base
(High)	0.749*** (9.54)	(0.048) 0.04	0.371** (5.57)
$TransactionType_j$ (Cash)	Base	Base	Base
(Forward Contract)	1.047*** (8.89)	-0.158 (0.39)	-0.253 (2.06)

Table 5. Pricing Choice Estimation Results

Independent Variable		Coefficient		
		High Supply Period	Low Supply Period	Combined Period
$ChoiceSelect_t$		0.114 (0.17)	0.670 (1.14)	0.397** (4.12)
$Y3Y4/5_t$		0.072 (0.03)	1.161 (2.706)	0.549** (4.93)
$Feedlot_j$	(1)	-2.655*** (44.93)	1.283*** (9.09)	-0.590** (5.70)
	(2)	-0.752* (3.47)	1.187*** (6.71)	0.392 (2.14)
	(3)	-1.918*** (23.70)	0.092 (0.06)	-0.841*** (11.58)
	(4)	1.015** (4.22)	0.469 (1.09)	0.792*** (6.94)
	(5)	1.606*** (12.54)	-0.415 (1.32)	0.404 (2.47)
	(6)	-0.243 (0.39)	-0.945** (6.32)	-0.478* (3.60)
	(7)	-1.503*** (15.12)	-0.629* (2.85)	-0.854*** (11.61)
	(8)	Base	Base	Base
$Packer_j$	(1)	-1.543*** (28.19)	0.906*** (8.43)	-0.150 (0.66)
	(2)	0.566* (3.56)	-0.210 (0.59)	0.277 (2.38)
	(3)	-0.686** (5.79)	0.862*** (11.11)	0.393** (5.20)
	(4)	Base	Base	Base

Table 5. Pricing Choice Estimation Results

Independent Variable	Coefficient		
	High Supply Period	Low Supply Period	Combined Period
n	517	549	1066
Likelihood Ratio	254.54	160.27	212.15

Numbers in parentheses are absolute values of calculated Wald chi square statistics; * = 0.10, ** = 0.05, and *** = 0.01 significance level.